DOCUMENT RESUME

ED 247 356 UD 023 737

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TITLE	The Later Effects of the Parent Education Follow Through Program on Achievement Scores for Matched Pairs of Program Children and Their Non-Program Siblings.
INSTITUTION	North Carolina Univ., Chapel Hill.
SPONS AGENCY	Department of Education, Washington, DC.
PUB DATE	84
GRANT	G00-77-01691
NOTE	26p.; Paper presented at the annual meeting of the American Educational Research Association (New Orleans, LA, April 23-27, 1984).
PUB TYPE	Reports - Research/Technical (143) -- Speeches/Conference Papers (150)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	*Achievement Gains; *Compensatory Education; Economically Disadvantaged; Elementary School Students; Elementary Secondary Education; Longitudinal Studies; Parent Participation; *Program Effectiveness; *Secondary School Students
IDENTIFIERS	*Impact; *Parent Education Follow Through Program

ABSTRACT

Fifty-one ninth through eleventh grade students who participated with their parents in the Parent Education Follow Through Program (PEFTP) while in elementary school were compared with their older, non-program siblings on the Differential Aptitude Test (DAT) and the Science Research Associates (SRA) Achievement Series. (PEFTP was a compensatory program designed for low-income children in grades K-3, with the focus on parent involvement in the education of their children.) No significant differences were found between the two groups on SRA performance, but on all three SRA subtests the PEFTP group mean scores were higher than those for the older sibling group. There were no significant differences between the two groups on the Vocational factor of DAT but there was a significant PEFTP-favoring difference on the Academic factor. For both DAT factors, the PEFTP group mean scores were higher than those for the older sibling group. (CMG)

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The Later Effects of the Parent Education Follow Through Program on Achievement Scores for Matched Pairs of Program Children and their Non-Program Siblings

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UD023737

Abstract

A longitudinal study of high school academic and vocational achievement for an elementary education parent involvement program is presented. Program students are compared to their older, non-program siblings on the Differential Aptitude Test and the Science Research Associates Achievement Series. After factor analyzing the Differential Aptitude Test, results showed a positive significant effect for an academic factor.

These results provide additional long-term achievement information for elementary compensatory programs and complement previous work with this sample on other school success variables. The achievement results are relevant to the students' aspirations beyond high school. Studies of this type allow for evaluation of long-term cost effectiveness and gains for the development of human potential.

The Later Effects of the Parent Education Follow Through Program on Achievement Scores for Matched Pairs of Program Children and their Non-Program Siblings

Since many compensatory education programs began during the late 1960's, some of the students are now of high school age. Consequently, it is now possible to examine long-term effects related to the participation of these students in an educational intervention during their early years of schooling. According to Goodrich and St. Pierre (Note 1), "The long-term effects of educational programs is an important but neglected area of study" (p. 1). One such compensatory education program which began in the late 1960's is the Parent Education Follow Through Program.

The Parent Education Follow Through Program (PEFTP) is one of fifteen federally funded, national Follow Through models which implements its compensatory elementary education program in various communities throughout the nation. The program was designed for low-income children in grades K-3 and is based on the belief that factors other than classroom instruction are important to quality education. The focus of the PEFTP model is upon parent involvement and participation in the education of their children. The major tenets of the program are that parents are the first and most important teachers of their children and that the home, the school, and the community should work in reciprocal ways to enhance the development of children. Three key features of the PEFTP are:

Paper presented at the American Educational Research Association annual meeting in New Orleans, April 23-27, 1984.

This study was supported by a grant from the United States Department of Education (Grant No. G00-77-01691) to the University of North Carolina at Chapel Hill.

The authors wish to express their appreciation to Dr. Richard Hunter and the Richmond Public School System for their cooperation and valuable assistance in data collection.

(1) a home visit component in which paraprofessional parent educators visit the homes of the children and deliver home learning activities which the parent does with the child, utilizing specific teaching behaviors; (2) a parent volunteer element in which parents spend time in their child's classroom, often engaged in instructional activities; and (3) active parent involvement in the governance and operation of the program.

The PEFTP has been implemented in communities around the country during the past 16 years. Each of these communities has worked closely with the model sponsor located at the University of North Carolina at Chapel Hill. The setting for this study, which will be described in more detail later, is one of these communities. Three groups of students in this community who entered the PEFTP in either 1969-70, 1970-71, or 1971-72, were in grades nine through eleven during the 1981-82 school year (the time of data collection), if normal grade progression is assumed. This sample will be discussed in greater detail in a later section.

Recently, the importance of investigating the long-term effects of programs for children and families has received increased attention (e.g., Gray, Ramsey, & Klaus, 1982; Schweinhart & Weikart, 1980; Cloud, Rentfrow, Hildebrandt, Abrams, & DeCausey, Note 2). The findings to be presented in this paper are one component of a longitudinal study which is being undertaken by the PEFTP to collect and analyze several categories of data pertaining to student outcome, such as school success variables, achievement scores and aptitude test performance.

The present study of school achievement and aptitude test scores is viewed as complementing earlier positive results for the same sample of subjects on drop-out rate, special education placement, and grade retention (Rubin, Olmsted, Szegda, Wetherby, & Williams, Note 3). In this previous study, significant differences in favor of the PEFTP students were found for drop-out rate, and for PEFTP females for grade retention. Additionally, it was found that of those children placed in special education classrooms, non-PEFTP siblings spent

more than twice as many years in these placements as did the PEFTP students.

The purpose of this study is to examine eighth grade achievement and ninth grade aptitude scores for students who have participated in the Parent Education Follow Through Program. The major objective of this later effects study is to compare PEFTP graduates with their older, non-PEFTP siblings on several achievement and aptitude measures.

Related Studies

Two types of longitudinal data will be included in this review. The first will consist of studies which focused on compensatory education programs involving preschool children and the second type will consist of programs which served elementary school aged children. It should be noted that for the purposes of this discussion, a study will be considered to be longitudinal if the data were gathered a minimum of three years after the intervention ended. A second criterion for including a study in this review was that the subjects on whom the data were collected must have been in any of the grades from seven to twelve.

Preschool Studies

The largest and most ambitious study of the long-term effects of preschool compensatory education has been that of the Consortium for Longitudinal Studies (Note 4). This collaboration of twelve experimentally designed and well-implemented preschool programs provided a wealth of data.

One of the twelve preschool programs included in the Consortium was the Early Training Project (ETP), developed by Susan Gray. Gray (1983) reports on a follow-up study that was begun seven years after the ETP's inception. Although no lasting effects were expected, it was found that there was a weak tendency for experimental females to score higher than other groups on intelligence tests. It was also found that the distribution of their grade point averages approached significance with the experimental females maintaining a higher average than the local control females. Also a slightly higher percentage of the experimental females graduated from high school.

Schweinhart and Weikart (1980) report that preschool education contributed to increased school achievement for elementary and middle school children. At age 14, there were highly significant differences in favor of program children on the California Achievement Test in Arithmetic, Reading and Language subtests.

A study was conducted by Miller and Bizzell (1983) which examined the long-term effects of four preschool programs on 6th, 7th, and 8th grade students. The four programs were: Traditional, Bereiter-Englemann, DARCEE, and Montessori. Differential effects related to preschool program and sex for all three middle school years were found for reading and math. Males from the Traditional and the Montessori programs scored significantly higher on the Stanford Achievement Tests than males from the Bereiter-Englemann and DARCEE programs. Females from the Bereiter-Englemann and DARCEE programs were slightly higher than other groups but not significantly so. Montessori males were consistently found to be the highest group.

Two final studies following up Consortium projects need to be mentioned. Karnes, Shwedel and Williams (1983) report no significant effects for high school achievement as measured by the Comprehensive Test of Basic Skills (CTBS). On the other hand, Palmer (1976) found significantly higher reading achievement at grade seven for those trained early versus their controls.

An eight year follow-up study of the long-term effects of ESEA Title I preschool and all day kindergarten students is reported by Nieman and Gastright (Note 5). At the end of both 4th and 8th grades, the treatment group was significantly higher on both the reading and total math subtests of the Metropolitan Achievement Test.

When summarizing the findings of several researchers who examined later effects of preschool intervention, Palmer and Anderson(1979) generally conclude that early intervention influences reading performance and shows strong evidence for effects on arithmetic achievement.

Elementary Studies

Data on school-aged compensatory education programs will follow. Cloud et al. (Note 2), using a conceptual model similar to that of the Consortium, examined the later effects of the Tuscon Early Education Model Follow Through Program. In their report concerning the high school success of Follow Through graduates and their siblings, Cloud et al. (Note 2) report on achievement as reflected by school grades rather than achievement test scores. Their findings were that although the differences in school grades for the Follow Through and non-Follow Through groups did not reach statistical significance, the Follow Through group had higher school grades in both math and science.

Gersten and Carnine (Note 6) report effects on achievement for 9th grade graduates of the Direct Instruction Follow Through model. Significant positive results on achievement were found in the urban, but not the rural Follow Through sites. Also, Weber and Fuhrmann (Note 7) report results that showed significant later effects in reading and math on the California Achievement Test for 9th graders who had completed the Direct Instruction program.

Maraschiello (1979) describes the results of a longitudinal analysis of school performance for children enrolled in the Follow Through programs in Philadelphia. Children from seven models were compared on achievement scores in total reading and total mathematics as measured by the California Achievement Test. The Educational Development Center Model was the only model which had consistent long-term effects on children's post-program (grade four to grade nine) achievement in reading and mathematics. Studied as a single unit, the total Follow Through program had a positive effect on mathematics achievement for both program and post-program years.

Seitz, Apfel, and Efron (1978) discuss later effects of the Bank Street Follow Through model. They report a pattern of Follow Through boys scoring higher than non Follow Through boys on mathematics, general information, and the

Peabody Picture Vocabulary Test. These results occurred at the completion of the program and remained similar through 6th and 8th grade retesting. Seitz et al. (1978) report the finding of a sleeper effect for Follow Through girls in spelling and total Peabody Individual Aptitude Test scores. The Follow Through girls scored significantly higher than the non-Follow Through girls in these areas. In another article related to this same study, Seitz, Apfel, Rosenbaum, and Zigler (1983) report on the meaning of their findings in terms of Head Start and Follow Through. They state:

> Our results indicate that an extensive period of school-based intervention during the child's first few years of school can have measurable lasting benefits for at least some groups of children. . . In terms of long-range effects, a consistent finding. . . was that the FT [Follow Through] group whose scores were superior to those of their NFT controls revealed their superiority in the areas of mathematics, general information, and PPVT [Peabody Picture Vocabulary Test] IQ. . . . Our results indicate no fade-out of Follow Through program effects on general information 6 to 7 years following termination of the program. (pp. 325-326)

Longitudinal data have been reviewed from both preschool and elementary compensatory education programs. These data have been related to the later effects of these programs upon students who have reached grade seven and beyond. The variables of interest for these later effects were limited to achievement and aptitude measures.

Overall it can be concluded that there is a clear pattern of program-favoring effects for achievement. Although statistically significant levels are not reached for all measures for all programs, the finding that some program advantages were found three or more years after program participation had ended is impressive.

In this paper we will contribute additional data to this bank of literature. These data will pertain to achievement and aptitude scores for 8th and 9th grade students who were early participants of the Parent Education Follow Through Program.

Method

Setting

This study was conducted in the city of Richmond, Virginia which is located in the center of a metropolitan area. The population of the entire metropolitan area is approximately 546,000, while the city of Richmond has a population of approximately 227,000 (Ellis, 1980).

The PEFTP was adopted by the Richmond Public School System in 1968. This system is basically an inner city school system with a predominantly black student population. Through the years the PEFTP has been implemented in 40 classrooms in 10 elementary schools around the city of Richmond. The level of program implementation has been consistently high as indicated by both local evaluation reports and model sponsor evaluation reports (Halstead, Note 8; Olmsted & Rubin, Note 9).

Sample

The sample of program children for this study has been drawn from those children who entered the program as kindergarten students during 1969-70, 1970-71 or 1971-72, or joined one of these cohorts before third grade. Using a 1980-81 directory of students in the community's school system, a listing was made of all program students in the system at that time. Utilizing the current student directory of the community to locate student files, the final list of subjects was compiled consisting of children who: (1) had participated in the PEFTP program for a minimum of two years; (2) had a sibling between 1 and 5 years older; and (3) had a complete cumulative school record as of the end of the 1980-81 school year. The initial number of subjects in the three cohorts was approximately 450 and the number who met the three criteria just listed was 122.

The sample of comparison children is composed of older siblings of students in the program sample. For each program child, the older sibling closest in age

who had not participated in the program and who had a complete cumulative record was selected for the comparison sample. The use of an older-sibling comparison group design has been reported by other researchers (e.g., Jensen, 1974; Cloud et al., Note 2). One advantage of an older-sibling comparison group design is the common backgrounds of the subjects in the two groups, including home, neighborhood or community, and school. Although evidence has been found of program effects diffusing down to younger children in the family, there has been no evidence of upward diffusion; so it is reasonably safe to conclude that there are few, if any, contaminating program effects for the comparison group (Gray, 1971; Moreno, 1974; Ware, Organ, Olmsted & Moreno, 1974).

The set of subjects for the current analysis consisted of 51 program children and their older siblings. Pairs for which either the PEFTP or older sibling student received special education or where complete achievement and aptitude files were not available were eliminated from the original sample. The ethnicity distribution for the 51 families was black = 98% and white = 2%. For both the Follow Through and the sibling groups, 53% were female and 47% were male. The levels of education for the father and mother for the families in the study were as follows:

Level of Education	% Fathers	% Mothers
8th Grade or less	3.9	5.9
9th-12th Grade	51.0	64.7
Beyond high school	3.9	11.8
No information	41.2	17.6

As of the end of the 1980-81 school year, 65% (n = 33) of the program children and 45% (n = 23) of the older sibling group were still enrolled in the Richmond Public School System. The distribution of the students in these two groups across grade levels was as follows:

Grade*	% PEFTP group	% Older Siblings
8	6.1	--
9	39.4	13.0
10	18.2	21.7
11	15.2	17.4
12	21.2	47.8

*Includes students in the grade level for initial time as well as those repeating a grade level.

Procedure

The initial step consisted of obtaining written consent from the school system for conducting the study, as well as consent from the Richmond PEFT program director and the chairperson of the policy advisory committee. Following this, the instrument on which student cumulative file information was to be coded was developed by the PEFTP model sponsor staff at the University of North Carolina in Chapel Hill (UNC-CH).

Data relevant to this study that were coded included the Stanford Research Associates (SRA) Achievement Series, taken in the eighth grade, first semester, and ninth grade Differential Aptitude Test (DAT) scores. Both of these tests were used because they are designed for somewhat different purposes. The SRA reflects academic achievement, whereas the DAT measures academic and vocational aptitude. The eighth grade first semester SRA scores were the grade/semester scores available for the majority of the sample, and the ninth grade DAT scores were the only ones available.

Five persons residing in the community were employed as coders. Their training consisted of 2 1/2 days of instruction and practice coding and was conducted on-site by a PEFTP sponsor staff member from UNC-CH. Once the training was completed, each person coded ten randomly selected student cumulative records for use in obtaining the first estimate of reliability (Time 1). This estimate was obtained by comparing the records of the coders with records coded by the trainer, who served as the standard criterion. A second estimate of reliability was obtained using the same procedure at the completion of the data

coding (Time 2).

Reliabilities (as compared to the criterion) for items relevant to the present study were as follows:

Item	Time 1	Time 2
ethnicity	100%	100%
sex	100%	100%
birthdate	96%	100%
SRA	94%	88%
DAT	98%	100%
parents' educational level	89%	84%
grade in 1980-81	86%	90%

Wherever the items consist of more than one variable (e.g. various SRA subtests), the reliability given above is the average reliability for the item.

One final reliability check was made between the person who coded the data for computer processing and the person serving as the standard criterion throughout the study. Each person computer-coded ten completed coding-forms received from Richmond. An estimate of inter-coder agreement was then calculated. All reliabilities for items relevant to the study ranged between 90% and 100%, with nearly all reliabilities being 100%.

Hypotheses

The data to be reported in this paper include only a small number of the total set of outcome variables. The hypotheses to be tested in this study are as follows:

1. There is no significant relationship between participation in the PEFTP and scores on the Science Research Associates (SRA) Achievement Series.

2. There is no significant relationship between participation in the PEFTP and scores on the Differential Aptitude Test (DAT).

Statistical Procedures

A Principal Components analysis was performed in order to reduce the eight DAT subtests to a smaller number of factors. Subsequently, Multivariate Analyses of Variance (MANOVAs) were performed separately for the SRA and DAT. A randomized

block design was employed to reduce error variance. The introduction of a variance component for family provides a more powerful test of group differences. The MANOVA for the SRA included the Reading Total, Mathematics Total, and Language Arts Total as dependent variables, while the MANOVA for the DAT included the factor variables as dependent variables.

Results

Descriptive and inferential statistics are presented in this section for both the SRA Achievement Tests (SRA) and the Differential Aptitude Test (DAT) analyses. For each of these analyses, statistical assumptions relating to normality and homogeneity of the variance-covariance matrices were investigated. The results of these tests are not reported except for cases where these assumptions were not met.

SRA

The test of homogeneity of the variance-covariance matrix for the SRA was significant, indicating heterogeneity. Therefore, a conservative F test would have to be met to indicate statistical significance (Geisser & Greenhouse, 1958).

Means and standard deviations for the three SRA subtests for the PEFTP and older sibling groups are reported in Table 1. It can be noted that in each case the PEFTP means are higher.

The omnibus conventional MANOVA was not significant, indicating that the conservative F test would surely have been nonsignificant if applied (Kirk, 1968). The results of the conventional test are provided in Table 2 (Wilk's Criterion = .9105, $F_{(3, 48)} = 1.57$, $p > .05$).

DAT

Principal Components analyses on the eight DAT subtests were first performed separately on the two groups. Subsequent to the finding that the pattern structure of the subtests for the two groups was not significantly different, the groups were combined and a single factor pattern derived. The first two factors

Table 1

Means and Standard Deviations on the SRA For PEFTP and Older Sibling Groups

PEFTP Group			
Subtest	n	Mean	Standard Deviation
Reading Total	51	313.69	50.30
Language Arts Total	51	324.27	48.91
Mathematics Total	51	333.22	61.95
Older Sibling Group			
Subtest	n	Mean	Standard Deviation
Reading Total	51	301.57	63.85
Language Arts Total	51	314.22	47.96
Mathematics Total	51	312.73	48.27

Table 2

MANOVA Results for the SRA Analysis

Test	F	df	p
Omnibus Multivariate Test	1.57	3, 48	$p > .05$
Reading Total	N/A*		
Language Arts Total	N/A*		
Mathematics Total	N/A*		

*Follow-up tests not appropriate.

were retained, and together they accounted for approximately 61% of the variance.

The resulting factor pattern, provided in Table 3, yields two factors which roughly correspond to an "Academic" and a "Vocational" Factor. The Academic Factor (Factor 1) has high loadings for the Verbal Reasoning, Numerical Ability, Abstract Reasoning and Language Usage subtests of the DAT, with moderate loadings for the Mechanical Reasoning and Space Relations subtests. In contrast, the Vocational Factor (Factor 2) has a high loading for the Spelling subtest, with moderate loadings for the Clerical Speed and Accuracy subtest, and a moderate negative loading for the Mechanical Reasoning, and Space Relations subtests.

Means and standard deviations for the two factors are presented in Table 4. It can be noted that in both cases the PEFTP means are higher.

The omnibus MANOVA, presented in Table 5, was significant (Wilk's Criterion = .8262, $F_{(2, 49)} = 5.15$, $p < .05$). Univariate follow-ups show a significant PEFTP-favoring difference on Factor 1 ($F_{(1, 50)} = 10.48$, $p < .025$). The difference for Factor 2, while PEFTP-favoring, was non-significant ($F_{(1, 50)} = 1.28$, $p > .025$).

Table 3

DAT Factor Pattern

DAT Subtests	Factor 1	Factor 2
Verbal Ability	0.735	-0.073
Numerical Ability	0.803	0.183
Abstract Reasoning	0.742	-0.255
Clerical Speed & Accuracy	0.186	0.571
Mechanical Reasoning	0.561	-0.515
Spatial Ability	0.540	-0.592
Spelling	0.447	0.760
Language	0.742	0.348

Table 4

Means and Standard Deviations on the DAT Factor Scores

For PEFTP and Older Sibling Groups

PEFTP Group			
Factor	n	Mean	Standard Deviation
1 (Academic)	51	38.42	8.26
2 (Vocational)	51	24.36	14.08

Older Sibling Group			
Factor	n	Mean	Standard Deviation
1 (Academic)	51	34.62	7.77
2 (Vocational)	51	21.83	12.69

Table 5

MANOVA Results for the DAT Analysis

Test	F	df	p
Omnibus Multivariate Test	5.15	2, 49	$p < .05$
Factor 1	10.48	1, 50	$p < .025$
Factor 2	1.28	1, 50	$p > .025$

Discussion

The results just presented indicate that there was a significant difference favoring the PEFTP group for overall DAT performance. Univariate follow-up analyses performed on the two DAT factors resulted in a significant PEFTP-favoring difference on the Academic factor and no significant difference between the two groups on the Vocational factor. For both DAT factors, the PEFTP group mean scores were higher than those for the older sibling group. Although no significant difference was found between the two groups on SRA performance, it is important to note that for all three subtests the PEFTP group mean scores were higher than those for the older sibling group.

The reader is reminded that the results should be interpreted with caution. The findings can only be generalized to a similar black urban population. In addition, it should be noted that the national Follow Through program was not originally designed as an educational experiment and therefore, no random assignment was employed. However, in this study, PEFTP students were compared with their siblings, so that many important socioeconomic and home background factors were adequately controlled. Additionally, many characteristics of the sample were representative of those of the general school population of Richmond.

An important factor pertaining to this study relates to the early stage of development of the PEFTP at the time when these families were participants. During these early years, program development was a major activity involving the pilot testing of both materials and methods for effective program implementation. The PEFTP program became more well-defined during the next few years.

When the issues presented above are taken into consideration, the finding that the PEFTP group means are higher than those of the older sibling group for all five comparisons may be stronger evidence of program effectiveness than might appear at first glance. Although significance is not reached for every

comparison, this pattern of Follow Through-favoring results is consistent with the results reported by other researchers.

In their study of long-term effects of preschool programs, Miller and Bizzell (1983) suggest that the early educational experiences which children have may continue to affect learning processes for many years. Seitz et al. (1978) speak of early school experience laying a general groundwork for later educational performance. Even though the PEFTP was still in its developmental stage, certain basic program elements were being implemented, albeit in unpolished form. These elements, including parent-child instructional interactions, home-school relationships, parental expectations for the child, etc., may have provided an educational base, the effect of which extended beyond the program participation years. The present results, coupled with the positive results for the same sample of students for school drop-out, grade retention and special education variables provide additional support for this supposition.

At this time, five Follow Through programs have reported significant later-effects of participation, noted at least three years after program participation had ended. When the preschool program longitudinal data, collected after a similar post-program interval, are added to the Follow Through longitudinal data, the evidence of the impact of compensatory education programs continues to grow. The effects of these special programs are not only immediate, but continue to last into middle-school and high-school years. The collection of longitudinal data needs to be continued in order to provide a larger information base for answering important questions about compensatory education. For example, "Do certain categories of children benefit more than others by participating in a particular compensatory education program?" and "What relationships exist between particular longitudinal effects and particular compensatory education programs?" The answers to these and other related questions will provide information to help guide the future direction of compensatory education.

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